Board of County Commisioners
Leon County, Florida

Workshop
On
Status of Internet Access for Rural Areas
in Leon County

12:00 pm – 1:30 pm
Tuesday, October 25, 2005

Leon County Courthouse
Commission Chambers
5th Floor

Board of County Commissioners
Workshop Item

Date of Meeting: October 25, 2005

Date Submitted: October 19, 2005

To: Honorable Chairman and Members of the Board

From: Parwez Alam, County Administrator
Kim Dressel, Director of Management Services

Subject: Status of Internet Access for Rural Areas in Leon County

Statement of Issue:
This workshop item presents information to the Board regarding the status of high speed internet services in rural areas of Leon County and seeks Board direction as to whether or not to pursue a pilot project to provide such services in areas of the County not currently served.

Background:
On August 30, 2005, the Board approved the scheduling of this workshop item in response to its previous direction to staff, at the July 12, 2005 Board meeting, to bring back an agenda item that addresses whether to start a pilot digital canopy project for internet access in rural areas of the County. This workshop will address several questions which have been raised about high speed internet access in Leon County revolving around coverage, competitive pricing, and availability to all. Also, the question that has been asked if the County government should lay fiber in its road right-of-ways during construction and/or maintenance projects as a means of providing infrastructure for high speed communication services will be addressed.

It was further requested that staff provide an update on the City of Tallahassee's Downtown Digital Canopy project. Previous updates to the Board about the City's Canopy project were provided in a July 18, 2002 memorandum, during the July 23, 2002 budget hearing, and during the April 8, 2003 Leon County MIS Technology Update Workshop.

Analysis:
To assist in the reading of this material, definitions of terms and concepts about internet access and computers are provided in Attachment 1.

Internet Access
For residential users there are two methods of connecting a PC to the internet: 1) by wire connected to a modem and a telephone line or cable line and 2) by wireless with an aircard device installed in a PC or laptop. The speed of the connection depends on the type of service and device used. Dialup

modems provide slow connections. Fast connections are referred to as broadband and allow users to access the internet and internet-related services at significantly higher speeds than traditional dialup modems. Which method a user chooses is determined by availability in their geographic area, their PC resources, needs, and their budget.

Why is speed a consideration? Some of the advantages of high-speed internet access are:
- The connection is always on, which means no dialup is necessary.
- The need for a second phone line is eliminated.
- Information can be accessed or downloaded into one's computer at significantly higher speeds (up to 100 times faster than dialup modems).
- Users can go online without tying up their telephone lines.
- Businesses can use broadband networks for videoconferencing and allow employees to telecommute.
- Users can tap into an expanded number of entertainment resources (gaming, streaming music and videos).
- Faster speeds enable workers to collect and process data in the field and then send that data back to their offices, as well as receive data from their offices while in the field.

Comparing Speeds
The speed of one's connection can vary based on the service and type of connection. Table 1 contrasts the download experience one can expect with a dialup 56k modem versus a 1.5 mps (megabytes per second) high speed broadband connection.

Table 1 Internet Speed Comparison			
Download Activity	File Size	56k dialup modem	1.5 mps high speed broadband
Loading a typical web page with graphics	150 kb	21 seconds	1 second
Opening a typical color 4" x 6" photograph	500 kb	1 minute, 13 seconds	2 seconds
Downloading a music file	1.5 mb	3 minutes, 44 seconds	8 seconds
Downloading and viewing a video file	3 mb	7 minutes, 29 seconds	16 seconds

For all connectivity options, when uploading or sending files to others, the experience is slower. Yet, with high speed broadband the experience remains substantially faster than with a 56k modem.

Availability of High Speed Internet Access In Leon County

High speed internet access exists in Leon County by several providers via a variety of methods: cable modem, DSL services, wireless broadband, and satellite service. However, the coverage for those methods vary within the County. Cable modems and DSL services are dependent on fiber cabling and/or telephone line infrastructure. Wireless broadband and satellite services are dependent on antennas placed on towers or other tall structures that connect back to a land based internet connection. Both fiber cables, telephone lines, and towers are costly infrastructure or plant which, in addition to cost, take time to site and install. Typically, this type of infrastructure is built and maintained by utility and/or cable companies which have the resources to incur the heavy investment required.

Sprint and Comcast are the two private utility/cable entities who have invested in the Leon County community to provide telephone and cable TV services. As technology opportunities for internet services became available, Sprint and Comcast improved and installed plant/infrastructure to offer high speed internet services. In general, the urban services area of Leon County and the western corridor along Hwy 20 have access to high speed internet service via cable modem through Comcast and DSL through Sprint. The ongoing expansion programs that Sprint and Comcast have in place for Leon County are shown on the attached map (Attachment 2).

- Sprint will have completed its expansion of its DSL services throughout most of the eastern portion of Leon County by year end of 2005.

- The extreme northeast area of Leon County will be covered by Sprint within six to twelve months.

- Other high density pockets within the County will be covered by Sprint within twenty-four months.

- Comcast is building out in part of the eastern part of the County in 2006.

These activities cover the areas of concern raised in the past: Ft. Braden, Killearn Lakes, Miccosukee, and Woodville. The remaining areas unserved by Comcast and Sprint are rural areas in the extreme northwest and southwest portions of the County where density of population is low and location to infrastructure/plant is distant. However, those areas will continue to be monitored for consideration in future expansion efforts by Comcast and Sprint.

Throughout Leon County, including areas unserved by DSL or cable, other types of high speed internet services are provided through satellite service by providers such as Dish Network and Direct TV and wireless broadband by providers such as Cingular, Sprint, and Verizon. Both types of services are considered available, although there may be pockets of area with connectivity strength issues due to terrain, tree and/or building obstructions. Current wireless broadband services may not

provide comprehensively throughout the County optimum performance and connectivity strength at this time. However, the wireless broadband services over cellular systems will improve greatly as the new standard for Wi-Max becomes more broadly adopted. It is expected this standard to be widely available in 2006.

Costs for High Speed Internet Access

Questions have been raised about the costs for high speed internet access and whether there is not enough competition to provide fair pricing. In addition to the main telecommunication/cable utility providers, Sprint and Comcast, and the various cellular companies, the Leon County market has over a dozen internet service providers (ISPs) who offer connectivity services. Note that these ISPs resell connectivity over Sprint's infrastructure/plant, as required by the 1996 Telecommunications Act. In addition to connectivity, these ISPs may provide other services such as email, web page creation and hosting, marketing, and other computer services. In the residential Leon County market the cost for high speed internet access ranges from monthly fees of $39.99 to $59.99, depending on the type of access (Table 2). Also, fees can be lowered if combined with other services that the provider offers (i.e., cable tv or long distance phone service). Some business only providers, such as Electronet, will provide residential service if the customer has a business service connection.

Table 2			
Sample of High Speed Internet Providers in the Leon County Area	Monthly Base Rates as of 10/2005		
	DSL Residential 3mps	Cable Residential 4mps	Wireless Broadband (Slower than DSL & Cable)
Comcast	n/a	45.95	n/a
Sprint	59.99	n/a	59.99
Verizon	n/a	n/a	59.99
Cingular	n/a	n/a	59.99
KMC	Business Only	n/a	n/a
NetTally	39.99	n/a	n/a
Electronet	Business Only	n/a	n/a
Earthlink	44.95	n/a	n/a
Dish Network	44.95	n/a	n/a

Note that providers do offer special promotions where monthly charges are less than shown in Table 2. For example, Comcast is offering a six month introductory rate of $19.99 at this time. Sprint, too, is offering special promotions as low as $24.99 (dependent on inclusion of other Sprint services).

A general comparison of various provided types and their costs (Table 3) indicate that the DSL and Cable fees typically charged in Leon County are in line with a national sampling of service providers.

Compare >>	DSL Internet	Cable Internet	Satellite Internet
Max. High Speed	Up To 1.5 Mbps	Up To 3 Mbps	Up To 1 Mbps
Avg. High Speed	467 Kbps *	708 Kbps *	400 Kbps *
Home Networking	Available	Available	Not Available
"Always On"	Yes	Yes	Yes
Internet Access	Existing Phone Line	Existing TV Cable	Satellite Dish
Service Area	Limited	Limited	Continental U.S.
Avg. Setup Fees	None to $100.00	None to $150.00	$99.00 to $399.00
Avg. Monthly Price	$34.95 to $59.95	$39.95 to $59.95	$99.99 / Mo.

* Average high speed Internet access #'s provided by ComScore Networks, March 2003.

Availability to All
It has been questioned if all citizens of Leon County have access to high speed internet service. When this question was posed several years ago, there was a definite void beyond the Urban Services Area. However, now all of the County area has coverage either by Sprint, Comcast, a host of ISPs (local and national), wireless or satellite service providers. To address "digital divide", the schools have free high speed internet access through Comcast for students. Additionally, the Leon County Main Library and its branches have a total of 141 public access PCs to free high speed internet. According to the Florida Public Library Standards, Leon County is considered to have an "Enhanced" availability (1 public PC per 2,000 population). The next highest level is "Exemplary", where availability is 1 public PC per 1,000 population. More access will be provided in the near future (within 4 months) when the Main Library and its branches will be outfitted for wireless internet connectivity. Library patrons will be able to bring in their personal laptops with wireless access cards and be able to connect to the internet as an added feature to their library experience.

Fiber in Right of Ways

It has been asked if the County government should lay fiber in its road right-of-ways during construction and/or maintenance projects as a means of providing infrastructure for high speed communication services. After consulting with Public Works, it was explained that during all County funded road reconstruction or maintenance activities, coordination with utility providers occurs to insure appropriate utilities are installed or reinstalled. As occurring with the current project to widen Orange Avenue, the communications utility providers were involved in planning sessions to ensure fiber and cabling were designed for installation.

During new development for subdivisions, the County coordinates with the utility providers and the developers to insure services are appropriately provided. Thus, the County does not actually lay fiber in its road rights-of-way nor does it have an ordinance mandating fiber be laid in new or repaired roads, but its practice has been to coordinate with utility providers to be sure appropriate utilities are installed.

City of Tallahassee's Digital Canopy Project

The City of Tallahassee's Digital Canopy project has been moved from the Electric Department to the Information Systems Section (ISS) for ongoing support and maintenance in the Downtown area and the Airport. The project will not be expanding beyond the Downtown area for the time being. However, City Electric is undertaking a pilot with FSU to test broadband access over power lines. This pilot is in the earliest stage of development and will test the technology and assess its viability for any long term use and broad deployment.

Hot Spots for Public Safety

There has been an expressed need to create "hot spots" throughout the County to provide wireless, secured internet access for law enforcement. The Sheriff's Office and MIS are reviewing needs and defining requirements for the development of hot spots strategically located for patrol cars and/or EMS ambulances to park and gain access to the County network in a secured manner to log in reports and access email.

Digital Canopy for the County

The question has been raised about setting up a digital canopy in rural areas of the County for residential use. From a technical perspective, it is possible to create a digital canopy. Costs can range from $10,000 to $100,000 per square mile. That range is broad because of the many factors involved – terrain, access to tall structures, distance to the actual land line, number of residents to be served, equipment for the residential structures. Recent Florida legislation requires certain criteria to be met when a local government decides to offer broadband internet services for a fee. The Florida

League of Cities provides a review of that legislation (Attachment 3) and the process required by the local government such as conducting at least two public hearings, providing a written business plan for review, passage of an ordinance. Additional materials (Attachments 4 and 5) are provided for reference regarding local government sponsored/owned broadband network development activities throughout the nation. The presentation at the workshop will review these materials with the Board.

Options:

1. Accept the Report on Internet Access for Rural Areas in Leon County.
2. Do no accept the Report on Internet Access for Rural Areas in Leon County.
3. Board Direction.

Recommendation:

Option #1.

Attachments:

1. Definitions of Commonly Used Terms for Internet Access and Computers
2. Map of High Speed Access Availability in Leon County
3. Florida League of Cities, Inc. – New Rules for Local Governments Providing Communications Services
4. State of the Market Report – September 2005, published by Muniwireless.com
5. Municipally Owned Broadband Networks: A Critical Evaluation, published by the Heartland Institute

PA/KD/PC

DEFINITIONS
of
COMMONLY USED TERMS FOR INTERNET ACCESS AND COMPUTER

Bandwidth - The amount of data that can be transmitted in a fixed amount of time.

Broadband Internet Access – refers to a high bandwidth (high speed) internet connection. Although the technical definition of broadband denotes communications that use a wide range of frequencies or channels, the commonly usage of the term broadband internet access simply means an internet connection faster than 56 Kbps. There are a variety of broadband options and different broadband internet providers. Two of the most common broadband internet service types are DSL internet access and cable internet access.

Connectivity Options

Dialup - This involves a modem installed in one's computer and connected to a phone line. Service providers such as AOL, MSN, and Earthlink provide the modem with access to the internet when it dials up a specified phone number, which is provided to the user. To prevent freeloaders from calling up, these service providers assign unique IDs and passwords.

The advantages to dialup internet access are its affordability and availability almost everywhere. The disadvantages include tying up a phone line, busy signals, not being on all the time, and being very slow, taking often 10 to 100 times as long to download images, web pages, and videos.

High Speed Dialup Internet – allows the experience of high speed internet service without the expense and commitment required for broadband internet services such as DSL and cable internet. While Web browsing is faster, dialup internet accelerators do not provide the performance of broadband services and generally do not improve the performance of file downloads.

DSL (Digital Subscriber Line) Internet – works over the user's existing telephone lines, but it doesn't interfere with their phone service like dialup internet access. DSL is 6 to 100 times faster than dial up connections and provides an always-on internet connection.

Cable Modem – is transmitted over TV cable, but doesn't interfere with TV cable access. Cable internet performance is similar to or faster than DSL service, with both offering far more bandwidth than dialup internet service.

Fiber to the Home (FTTH) – fiber optic cabling installed directly to the residence.

Power Line Broadband – delivery of data communications over the existing electric power distribution network at speeds comparable to DSL and cable modem.

Satellite Internet - allows a user to access the Internet through a special satellite modem, which broadcasts requests to a satellite dish that sits on top of the residence or business. Because of the enormous distances signals must travel from the earth to the satellite and back again, satellite broadband is currently slower when compared to a DSL Internet service.

Wireless Internet - allows connection to the Internet using radio waves instead of phone lines. Wireless Internet is very fast and can transmit information hundreds of times faster than a dialup service. Wireless internet connections, at present, are more vulnerable to periodic interruptions more than other means of connecting to the internet. Bad weather, or particularly good, hazy weather, can affect the signal. Limited bandwidth can impact throughput.

> **EV-DO** – (Evolution Data Optimized) wireless access to the Internet over a cellular network at an average speed of 300 to 500 kps with a wider range than Wi-Fi. Verizon and Sprint are beginning to roll out this service in the Tallahassee area now.
>
> **Wi-Fi** – a wireless network connected to a land based internet service using multiple access point devices that provide coverage within a 300 foot area. This technology is used in places such as Starbucks, areas in buildings (such as the 5th Floor Chambers and the Courtrooms in the Courthouse and soon to be in the public areas of the main Library and its branches), and the City of Tallahassee's Digital Canopy in Downtown and at the airport.
>
> **Wi-Max** – a wireless network connected to a land based internet service using access point devices that can provide coverage up to 31 miles and provide data rates up to 75 mps. This technology is based on a new standard that provides security and quality of service features that are missing with the Wi-Fi standard. Hardware providers have begun integrating this standard in the communication devices of laptops, cell phones, and PDA's. Wi-Max technology should be broadly available in 2006 where such a network could be established in Tallahassee, if desired.

Connectivity Speeds

56K – 56,000 bits per second

1.5 mps – 1.5 megabits per second

3 mps – 3 megabit per second

Computer Terms

Central Processing Unit (CPU) - The CPU is the brains of the computer. Sometimes referred to simply as the processor or central processor, the CPU is where most calculations take place. In terms of computing power, the CPU is the most important element of a computer system.

Megahertz (MHz) - A measure of speed of a computer processor.

PDAs (Personal Digital Assistants) – small hand-held electronic devices that manage address books, lists, calendars and store limited amounts of data. The latest models can have cell phone capabilities and can send and receive email messages (i.e., Blackberry and Treo).

Random Access Memory (RAM) – The "working memory" of a computer into which programs can be introduced and then executed.

THOMAS COUNTY

JEFFERSON COUNTY

MOCCASIN GAP

INTERSTATE 10

MICCOSUKEE

CENTERVILLE

THOMASVILLE

MAHAN

AP ALACHEE

TRAM

WOODVILLE

MERIDIAN

INTERSTATE 10

THARPE

TENNESSEE

MONROE

ORANGE

CAPITAL

CRAWFORDVILLE

SPRINGHILL

BLOXHAM CUTOFF

WAKULLA COUNTY

BLOUNTSTOWN

GADSDEN COUNTY
LIBERTY COUNTY

MAP PREPARED 10/19/05

Miles
0   2.5   5   7.5

Tallahassee-Leon County

www.TLCGIS.ORG

Legend

- ● BUILDINGS (> 500 SQ FT, OUTSIDE CURRENT SERVICE AREA)
- ▬ LEON COUNTY BOUNDARY
- CITY LIMITS
- MAJOR ROADS
- CURRENT SERVICE AREA (SPRINT AND COMCAST)
- SPRINT COVERAGE (NOW & BY 12/05)
- SPRINT COVERAGE 6 - 12 MONTHS
- SPRINT COVERAGE WITHIN 18-24 MONTHS
- FUTURE EXPANSION (SPRINT)
- COMCAST COVERAGE BY 2006
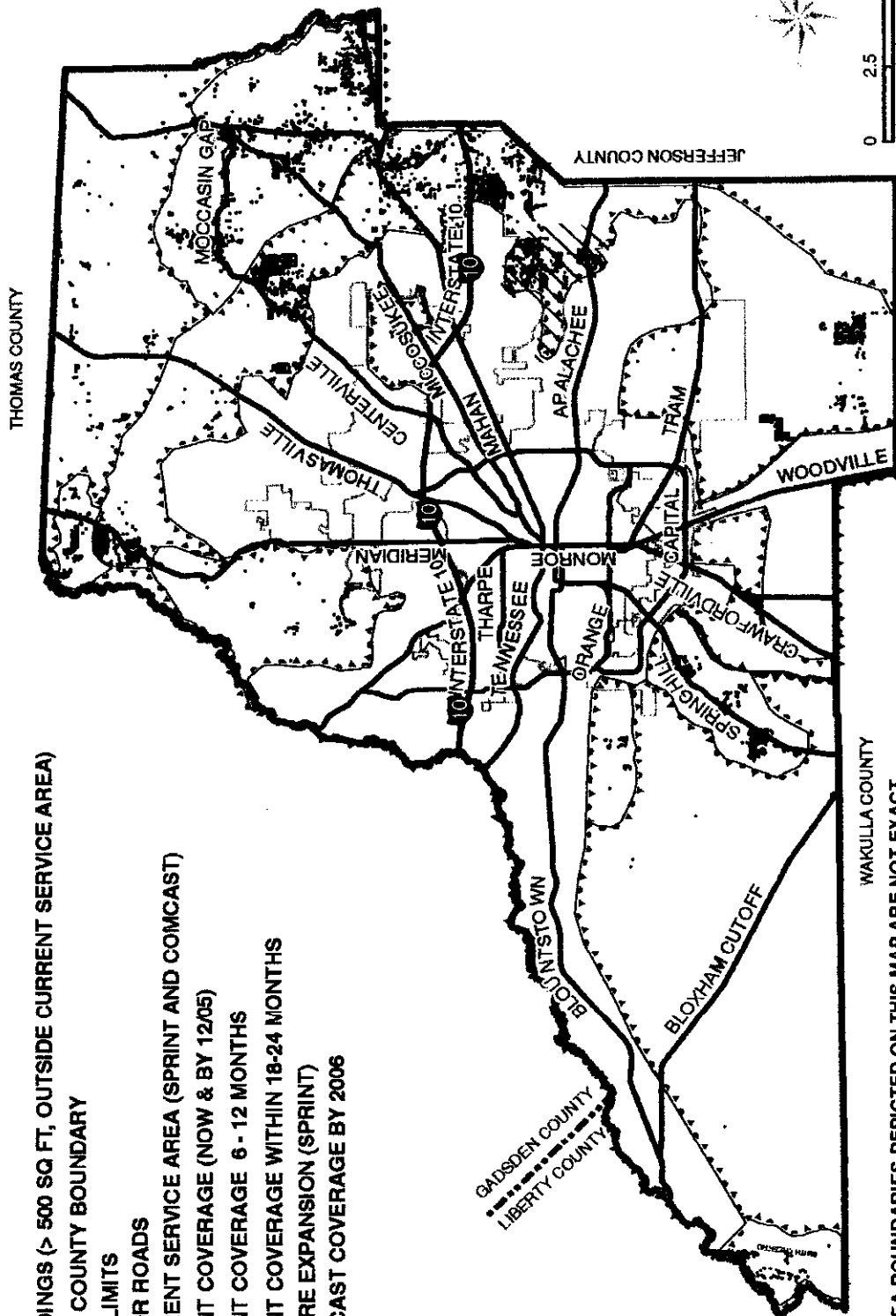
NOTE: THE SERVICE AREA BOUNDARIES DEPICTED ON THIS MAP ARE NOT EXACT.
THE MAP IS DESIGNED TO BE A GENERAL REPRESENTATION AND SHOULD NOT BE
RELIED ON BY SPRINT OR COMCAST'S RETAIL OR WHOLESALE CUSTOMERS FOR
SERVICE AVAILABILITY OR MARKETING PURPOSES

HIGH SPEED INTERNET ACCESS AVAILABILITY
CURRENT AND FUTURE EXPANSION

NOTE: This product has been compiled from the most accurate source data
from Leon County, the City of Tallahassee, and the Leon County Property
Appraiser's Office. However, this product is for reference purposes only
and is not to be construed as a legal document or survey instrument.
Any reliance on the information contained herein is at the user's own risk.
Leon County, the City of Tallahassee, and the Leon County Property Appraiser's
Office assume no responsibility for any use of the information contained herein
or any loss resulting therefrom.

New Rules for Local Governments Providing Communications Services

by Kraig Conn

After significant maneuverings by the communications industry, local government representatives and the Governor's Office, the Florida Legislature this year passed compromise language addressing local governments that provide communications services, which includes Internet access, cable service and telecommunications services.

The bill, CS/CS/SB 1322, applies to "governmental entities," which include municipalities, utility authorities, or any other authority or instrumentality, agency, unit or department of municipalities. Significantly, the provisions of the bill do not apply to municipalities providing a communications service for no fee or other consideration (for instance, when a city offers free wireless Internet access in a downtown or other area). The bill also does not apply to any communications service a governmental entity provides to itself or to another governmental entity. (Many cities offer communications services to other governmental entities, such as school districts, universities, other cities or counties, and government hospitals.) The bill also provides a broad exemption for airport facilities. Therefore, the primary scope of the legislation is governmental entities that provide communications services to private citizens and businesses for a fee or other consideration.

Under CS/CS/SB 1322, governmental entities that propose to provide a communications service must hold at least two public hearings, at least 30 days apart. Notice of the first hearing must be provided by newspaper ad, and the governmental entity must electronically provide notice of the hearing to the Florida Department of Revenue and the Florida Public Service Commission. The notice must include, at a minimum, the geographic areas proposed to be served by the governmental entity, and the services, if any, that the governmental entity believes are not being adequately provided currently. The notice must state that any dealer of communications services which wishes to do so may appear and be heard at the public hearings.

At the public hearings, the governmental entity must, at a minimum, consider a specified list of topics. These topics include whether the service proposed to be provided is currently being offered in the community; whether a similar service currently is being offered in the community; whether private service providers propose to offer the same or a similar service; and what assurances the private service providers are willing or able to offer to provide the service. The governmental entity also must consider the capital investment required to provide the communications service; estimated operational and maintenance costs; and, using a full-cost accounting method, the estimated revenues and expenses of the service and financing.

Also at the public hearings, the governmental entity must make available to the public a written business plan for the proposed communications service. The business plan must include, at a minimum, the projected number of subscribers to be served by the service; the geographical area of the service; the communications services to be provided; a plan to ensure that revenues exceed operating expenses and payment of principal and interest on debt within four years; and estimated capital and operational costs and revenues for the first four years.

Once governmental entities perform the required two public hearings and develop their written business plans, authorization to provide the communications service may be given through passage of a resolution, ordinance or other formal means of adoption.

The legislation also states that governmental entities may issue bonds to finance the capital costs for facilities to provide a communications service, with the following limitations:

- A municipality may pledge only the revenues generated from within its corporate limits, or generated within an area in which the municipality provides water, wastewater, electric or natural gas service, or within an urban service area designated in a comprehensive plan, whichever is larger.

- A municipality may pledge revenues generated outside of this geographic area, as long as the municipality obtains the consent of the governmental entity within the boundaries of which the municipality proposes to provide the service. However, the governmental entity from which consent is sought must be located within the same county as the municipality.

- Revenue bonds are not subject to approval of the electors if the revenue bonds mature within 15 years, but must be approved by the electors if the bonds do not mature within that period.

In addition, the legislation states that governmental entities providing communications services may not price any service below the cost of providing the service by subsidizing it with other revenues. The cost standard for determining cross-subsidization is whether the total revenue from the communications service is less than its total long-run incremental cost.

Also, governmental entities providing a communications service must comply with current law regarding annual financial reports, and must keep separate books and records, maintained in accordance with generally accepted accounting principles, of the communications service. To facilitate equitable distribution of indirect costs, local governments are to develop and follow a cost-allocation plan, which is a procedure for allocating direct and indirect costs.

In addition, the bill states that governmental entities must establish enterprise funds to account for their operation of communications services. They also must adopt separate operating and capital budgets for communications services. The governmental entities may not use their powers of eminent domain solely or primarily for the purpose of providing a communications service. And they must comply with specified federal and state laws, depending upon which communications service is offered.

At a public meeting, a governmental entity must conduct an annual review to consider the progress being made toward reaching its business-plan goals and objectives for providing communications services. If, after a four-year period, revenues do not exceed operating expenses and payment of principal and interest on debt, a governmental entity must take one of the following actions:

- It can approve a plan to cease providing the service.
- It can approve a plan to dispose of the communications system.
- It can approve a plan to create a partnership with a private entity to operate the system.
- It can simply approve continuing provision of the communications services by a majority vote of the governing body of the governing authority.

Finally, the bill provides broad grandfathering provisions for any governmental entity that was providing a communications service as of April 1, 2005; for any governmental entity that had issued debt pledging revenues from a communications service as of April 1, 2005; and for any governmental entity that had purchased equipment specifically to provide communications services as of April 1, 2005, and had taken formal action to provide such service as of May 6, 2005.

While the provisions of CS/CS/SB 1322 appear to be extensive, the numerous local government representatives involved in negotiating the bill determined these to be reasonable. A great deal of thanks goes to Sen. Lee Constantine, R-Altamonte Springs, and the Governor's Office for brokering the compromise language and holding the communications industry to the agreement. The House bill on this matter, which did not pass, was essentially a "barrier to entry" for local governments to provide communications services. Fortunately, it was the compromise language that passed the Legislature.

Kraig Conn is deputy general counsel and legislative counsel for the Florida League of Cities.

STATE OF THE MARKET REPORT

SEPTEMBER 2005

CONDUCTED AND PUBLISHED BY MUNIWIRELESS.COM

INTRODUCTION

OUR ANSWERS FOR THE MARKET'S IMPORTANT QUESTIONS

FOR MORE THAN TWO YEARS, I'VE WATCHED THE MUNICIPAL wireless marketplace develop. I've followed companies on both the buy and sell sides of this business as they've envisioned the promise of municipal wireless, worked to overcome the technical, business and political challenges, and turned this into an exciting, dynamic industry.

And on countless occasions, I've fielded inquiries from product suppliers, integrators, consultants, IT managers and elected officials on the same two questions: How big is this market, and how fast will it grow?

The 2005 Municipal Wireless State of the Market Report is our answer to those questions.

The report is timely and necessary because the municipal wireless space has become a true marketplace of buyers worldwide—municipalities and regions—seeking to procure services, software and equipment from a vast array of vendors. To help those vendors and their investors plan their business strategy and operations—financing, R&D, production, distribution and marketing—they need to know the size of the market for their offerings.

An essential resource for the market's buyers, sellers and influencers
The size of the market is also critical to people who develop applications that will be used on wide-area wireless broadband networks. For much of the market's first few years, the initial applications deployed are those used only by municipal employees such as police officers and building inspectors. In the future, the most interesting ones will be those to be used by everyone – businesspeople, students, artists, web designers, nurses, etc. The first applications for this broader market are already here, but they are focused on social networking and community building. For people who are set to spend money on developing these and

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other types of applications, they need to know if the market is large enough to justify significant investments of time and money.

One important note: Because most of the deployments to date have taken place in the United States, that's where we've focused our initial market estimates. With deployments already starting to take place in Europe and in major Asian markets, we expect to expand our research efforts in next year's report to make this a truly global market estimate.

This inaugural report is intended for the benefit of the entire industry, whether your organization already is in the market as a buyer, seller or influencer, or are considering taking the initial step. We hope you find this report to be an important tool for your business planning. For us at muniwireless.com, it's a labor of love.

For those of you who may not be familiar, I also publish an annual mid-year report on the market, with special focus on the status of all municipal wireless activity that I'm aware of, both in the U.S. and internationally. You can download it for free:

http://muniwireless.com/ downloads/778

Of course, we welcome any feedback or suggestions you may have, so we can make subsequent editions of this report even more valuable.

Esme Vos

Esme Vos
Founder
muniwireless.com

2005
State of the
Market Report

METHODOLOGY

Tabulation, analysis and modeling were provided by Guy Currier of Market Art mediaworks, a New York–based research and marketing consultancy. Currier has provided market modeling and research services to such clients as General Electric, Ziff Davis Media and Penton Media. He researched and wrote Yahoo! Internet Life's "Most Wired Cities" report in 2002 and 2003.

DATA COLLECTION

Administrators and technology managers at 26 municipalities in the U.S. were interviewed by phone and e-mail between July 15 and September 6, 2005 to determine the scope, utilization and expected spending levels for municipal wireless networks currently installed or expected to be installed within the next two years.

WEIGHTING

Initial analysis identified four clusters based on municipality type and population:
1. counties
2. large cities (population of 500,000 or more)
3. medium cities (population between 100,000 and 499,999)
4. small cities (population less than 100,000)

To provide weighted results, muniwireless.com's most recent census of U.S. municipalities currently in some stage of network deployment was used. Survey results in each cluster could then be multiplied by a weighting factor representing the ratio between the number of surveys performed to the number of census municipalities in that cluster.

PROFILING AND DATA BACKFILL

A network acquisition profile was built for each survey response, identifying year of deployment and year-by-year spending levels. These individual profiles were combined by cluster to build a more generalized profile for use both in weighting and in spending projections. Profile analysis yielded four generalized stages of network acquisition:

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- Stage I: Initial discussions and study
- Stage II: RFP/RFQ process and initial ramp-up
- Stage III: Installation/deployment
- Stage IV: Maintenance

Each stage was qualified within each cluster by duration, spending level, and spending break-down (products, services, etc.).

Additionally, these profiles were used for data backfill, where survey responses were insufficient or incomplete. Values from valid responses within a cluster were used, where available, to backfill incomplete responses in the same cluster.

MODELING AND PROJECTIONS

Within each cluster, regression analysis was applied to data concerning the year of network installation to model the rate of deployment among municipalities within that cluster. These deployment rates were then used with the census counts to estimate the number of municipalities deploying wireless networks in the years 2004–2007. The result was a grid for each year, showing the number of counties, large cities, medium cities, and small cities expected in each stage of deployment.

Market sizing was achieved by using the network acquisition profiles developed for each cluster in combination with the model.

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EXECUTIVE SUMMARY

In some ways, the municipal wireless market wouldn't appear to have much in common with the mainstream commercial market for IT products and services. After all, it's a market where customers' decisions often are driven more by election-year politics than by a need to align IT with business goals.

But this market has developed rapidly, largely because when it comes to this technology and its deployment, municipal customers have demonstrated they have a lot in common with their commercial counterparts in the area of new-technology adoption.

HOW WE GOT TO THIS POINT: ADOPTION OF MUNICIPAL WIRELESS NETWORKS

As is often the case in new markets, the industry's first movers were the small players. Small communities such as Chaska, Minnesota (population: 18,000) and Scottsburg, Indiana (population: 6,000) were among the first municipalities not only to understand municipal wireless' promise, but to actually do something about it.

In the case of Chaska, the community's need for affordable broadband drove the city to build its own network and offer service to residents. When Chaska launched its network in spring 2004, residents could purchase broadband service for $16 per month (1 Mbps symmetrical bandwidth), a rate that is still among the lowest in the US.

Scottsburg faced an even more serious problem. The local car dealership informed the mayor that its franchise was required to get broadband access to download repair manuals and conduct automobile diagnostics. The town, which was still on dial-up access, stood to lose 70 jobs. The mayor and the city council asked an incumbent operator to bring broadband to Scottsburg, but the operator was not interested. In addition to the Chrysler mechanics, many Scottsburg residents who performed medical transcription work told the mayor that they would have to move elsewhere if the town did not get high-speed Internet access. Faced with economic catastrophe, Scottsburg deployed a wireless broadband network at a cost of $385,000 within three months. The added benefit of the network is that it saves the school system $6,000 per month in telecommunications costs (an amount that could pay for another teacher).

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Until now, most of the deployments have occurred in towns and small cities such as Chaska and Scottsburg. Cities with populations over 500,000 have only begun to issue RFPs for citywide wireless broadband service, and the tide of large cities doing so has been, unsurprisingly, slow to build. The reason: Small towns and cities have less bureaucracy, fewer warring factions and less complex infrastructure issues than large cities. Moreover, unwiring a small city is less expensive and more easily managed than doing so in a large city with densely populated downtown areas.

VISIONARIES AND EARLY ADOPTERS

There's a trend that's quickly becoming a fact in the market's development: Fast-growing communities are leading the way in deployments.

In the past year, there's been a significant increase in interest from cities with populations between 50,000 and 200,000, which also tend to be fast-growing communities. These cities typically are attracting new residents fleeing real estate markets that are priced out of the reach of middle-class families. For example, the cities of Fresno and Ripon in northern California are seeing people move to their area from San Francisco, whose rents and housing prices are too high for most families. Because the fast-growing cities do not have unlimited budgets to serve the increased population, they are looking for ways to make their municipal employees work more efficiently and cheaply, but still be able to deliver good service to the growing population. They are looking to streamline and improve city services through the use of a citywide wireless network.

These early adopters are quickly being joined by larger cities and counties getting into the act. Among large cities, the interest in citywide Wi-Fi has increased dramatically; Philadelphia and Minneapolis have already issued RFPs for municipal networks, San Francisco is awaiting responses for its RFI (request for information), and Portland has just announced its own RFP. Why the interest among larger cities which many consider to have sufficient broadband penetration? The same issues apply here for large municipalities – cutting costs and delivering service more efficiently. But these larger communities also are looking to bridge the digital divide. In many large cities, broadband penetration is grossly unequal. In New York City, large areas of the Bronx and Brooklyn have no broadband access. Cities like New York and Philadelphia are looking for

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citywide Wi-Fi to help balance out the unequal distribution of broadband service and create a more competitive marketplace for broadband services.

Counties have been the latest governmental entities to begin deploying networks. The reasons: to streamline operations, connect small towns and cities in their territories and improve county services. Washington County in Oregon has issued an RFP for a countywide network devoted to public safety; five counties in Michigan want wireless networks for public access and municipal use, as does Sandoval County in New Mexico.

Among the early adopters of citywide Wi-Fi is Corpus Christi in Texas. Unlike other cities that deployed networks for public safety use or to deliver broadband Internet access to residents, Corpus Christi built a citywide network for automated meter reading (AMR). The Corpus Christi network collects data from gas and water meters, allowing the city to reduce the cost of sending people out to gather the data. While AMR has long been considered an application for cellular wireless data networks, many cities find cellular subscription plans too expensive. Running on a citywide Wi-Fi network, however, AMR is attractive to cities and counties. Now that the price of gasoline has increased significantly, not having employees drive around checking meters saves a significant amount of money.

The town of Monticello, Florida also is using its new municipal wireless broadband network to deliver not just public access, but also automated remote monitoring of water towers, wells and wastewater treatment plants. Not having an employee driving around on a daily basis, plus elimination of alarm companies monitoring four locations for break-ins and chlorine gas leaks, yields a savings of more than $25,000 per year.

Devices that talk to one another without human intervention within a city or countywide network will become popular in communities struggling to reduce costs and improve service. Applications that allow machines to monitor, warn and even repair themselves will become a significant driver of wireless broadband deployment.

THE NEXT FEW YEARS: SEVEN IMPORTANT TRENDS

As small, nimble municipalities increasingly are joined by larger communities in building out their own wireless infrastructure and unleashing new applications, several key trends are likely to emerge:

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1. The fastest-growing U.S. cities will deploy citywide wireless broadband to be able to serve a growing population far more cost efficiently than traditional wired infrastructure.

2, More counties will deploy countywide wireless broadband. They will act as demand aggregators, especially in rural areas where individual towns are too small to be of interest to broadband service providers.

3. Municipal utilities increasingly will enter the market for delivering broadband services. Because many already have a fiber backbone as well as a billing relationship with their customers (and rights of way for installing wireless equipment), in many regions the local utility will be the entity of choice for the deployment.

4. Large cities (500,000+ population) will deploy citywide Wi-Fi, but their business model will most likely take the form of a public-private partnership, given the complexity of the projects and the number of constituencies they have to serve.

5. Citywide wireless broadband will be used by city governments to reduce the cost of telecommunications, improve the productivity and efficiency of city workers and deliver better municipal service to residents. We will see an increase in the number of applications developed for use by police officers, building inspectors, traffic management, AMR, SCADA, utility workers and inspectors, vehicle tracking, video monitoring, health and human services employees, teachers, etc.

6. As more people use these networks, more companies will develop applications for the consumer market—social networking applications, location-based services, etc.

7. More and more cities will offer free access. The cost of the network will be paid for by advertisers (companies such as Feeva and Google are serving as the model for this scenario).

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MARKET SIZING AND GROWTH PROJECTIONS

OVERALL SPENDING

When discussing market sizing and growth projections, it's hard not to recall Mark Twain's comment that there were three kinds of lies: "Lies, damned lies and statistics."

Then again, Samuel Clemens never had investors to which he was accountable – nor did he have to make multimillion-dollar decisions to spend the public's money based on nothing more than intuition.

The sheer volume of planning, discussion and activity surrounding municipal wireless makes it apparent that this is one hot market. But until now, just how big this market really is has been an exercise in guesswork.

But this inaugural Municipal Wireless State of the Market Report pinpoints the market's size and its frenzied growth potential. The 2005 U.S. market for municipal wireless spending will exceed $76.5 million, an increase of 142% over last year's $31.5 million.

Even more impressive, however, is the market's growth trajectory. All the talk the past two years about larger municipalities examining and finally making the move to deploy their own wireless networks is beginning to translate into actual spending—and that spending will accelerate over the next few years.

In 2006, for instance, we're predicting the U.S. market will again more than double, exceeding $177.7 million by the end of next year. And municipal interest and activity won't slacken anytime soon: our projections put the 2007 market at a robust $405.6 million.

2004-2007 U.S. SPENDING FOR MUNICIPAL WIRELESS NETWORKS

	2004	2005	2006	2007
Spending ($ millions)	$31.5	$76.5	$177.7	$405.6
YTY Growth Rate	N/A	142%	132%	128%

SOURCE: 2005 MUNICIPAL WIRELESS STATE OF THE MARKET REPORT (MUNIWIRELESS.COM)

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Now, let's stop for a moment and put these impressive numbers into perspective. Overall 2005 spending by U.S. municipalities of $76.5 million is a small fraction of total state/local government technology spending of about $50 billion. But keep in mind that this is a market literally in its infancy; not only is the underlying technology still nascent, but municipalities are just beginning to understand what's possible with wireless networks. Add to that the still-developing universe of experts with the requisite technical, business process and municipal planning skill sets, and it's hard to argue that going from zero to nearly $100 million in a few short years is quite an achievement.

SPENDING BY MUNICIPALITY TYPE AND SIZE

Another important sidebar to the overall market size and growth trend is the fact that this growth is coming from all different sizes and types of U.S. municipalities: small, medium and large cities, as well as counties.

2005 MUNICIPAL WIRELESS SPENDING BY MUNICIPALITY TYPE
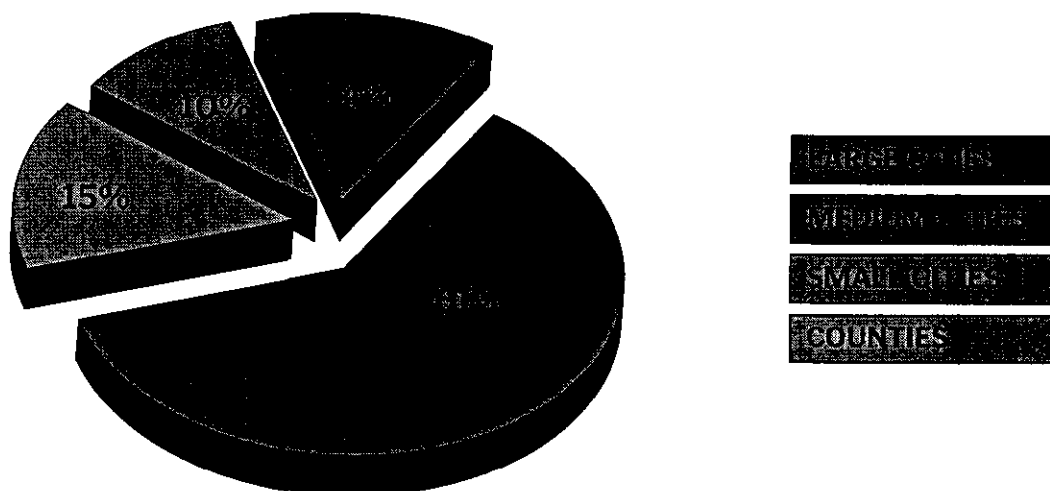
SOURCE: 2005 MUNICIPAL WIRELESS STATE OF THE MARKET REPORT (MUNIWIRELESS.COM)

Not unexpectedly, large cities – those with populations greater than 500,000 people—represent the lion's share of current and future spending on municipal wireless networks. While smaller municipalities were more likely to commit to network deployment early on, the impact of larger municipalities'

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moves is dramatic because....well, they're a lot bigger. Networks planned and deployed in places like Philadelphia, San Francisco and Los Angeles cover much larger physical geographic footprints and have to support far more users, whether those users are municipal employees, local businesses or residents.

It's hardly surprising that large cities own the dominant position among municipalities when it comes to expenditures—for instance, a variety of public estimates have pegged initial network deployment in large cities like Philadelphia at anywhere from $10 million to more than $20 million.

Portland, Oregon is the latest metropolis to issue an RFP for a citywide Wi-Fi and WiMax network serving not just the general public, but also municipal employees, public schools and the metropolitan transit authority. And as cities such as Portland and Philadelphia demonstrate that it can be done, more cities and counties will follow their lead. With expertise developing among an even larger group of consultants and vendors, the risks of deploying a network of immense scale will become manageable.

THE IMPACT ON MUNICIPAL OPERATIONS

While most of the discussion today focuses on Internet access for the general public, the most significant impact that a citywide wireless network will have is on municipal operations. All of large cities that are deploying these networks intend to use them to cut telecommunications costs (in Philadelphia alone, these costs are in the millions of dollars), streamline operations and improve productivity. City employees for whom mobility is a critical part of the job (for example, police officers and building inspectors) benefit by having the ability to do more of their work in the field. With rising gasoline costs, simply cutting down on trips that employees have to make to file reports at the office will save the city a significant amount of money.

Indeed, because so many people—municipal employees, residents and businesses—benefit by having always-on, ubiquitous access to their office networks and the Internet, we cannot fully envision today the kinds of applications they will use. The impact on quality of life, cost reduction and productivity will be dramatic—just as in 1990, when we could not fully imagine all of today's applications for the Internet.

The universe of private companies that will benefit from the deployment of citywide wireless networks—and indeed countywide networks—extends

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beyond those who sell infrastructure equipment, services and software. We will see many more in the area of applications for public safety, remote monitoring of facilities, vehicle tracking, social networking, community broadcasting, etc. If one also considers the money that municipalities (and residents) will spend on these applications, the market looks very promising indeed.

NETWORK UTILIZATION TRENDS

Our research points to an important trend affecting the market's development: How these municipal networks are being utilized, and who's utilizing them.

NETWORK UTILIZATION BY AUDIENCE: 2005

INTERNAL

RESIDENTIAL

55% BUSINESS

42% ALL
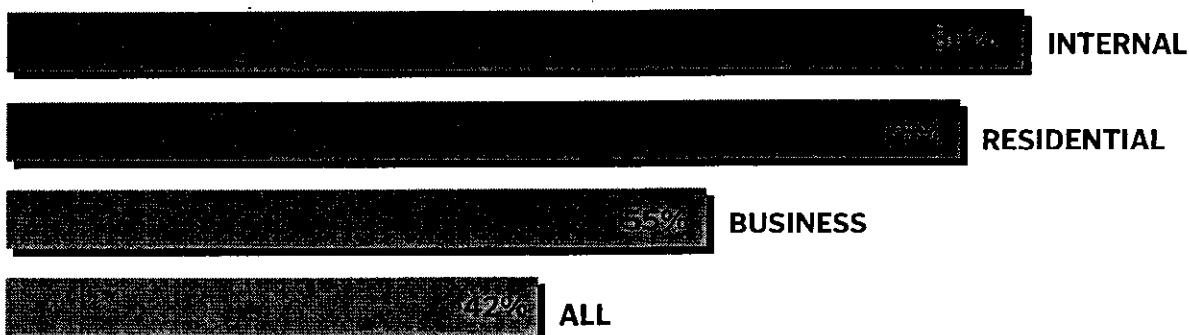
SOURCE: 2005 MUNICIPAL WIRELESS STATE OF THE MARKET REPORT (MUNIWIRELESS.COM)

A strong majority of municipalities—80 percent, by our estimation—are using the networks for some form of "internal" application, such as public safety, public-utility monitoring or asset tracking. But, particularly in smaller cities and rural counties where major telecommunications carriers have held back in providing broadband access due to economic considerations, these networks are gaining widespread utilization by both local businesses and residential users.

And, in fact, nearly one-half (42 percent) of municipalities with some form of their own wireless network are seeing their infrastructure being used by all three constituents: municipal workers, local businesses and residents.
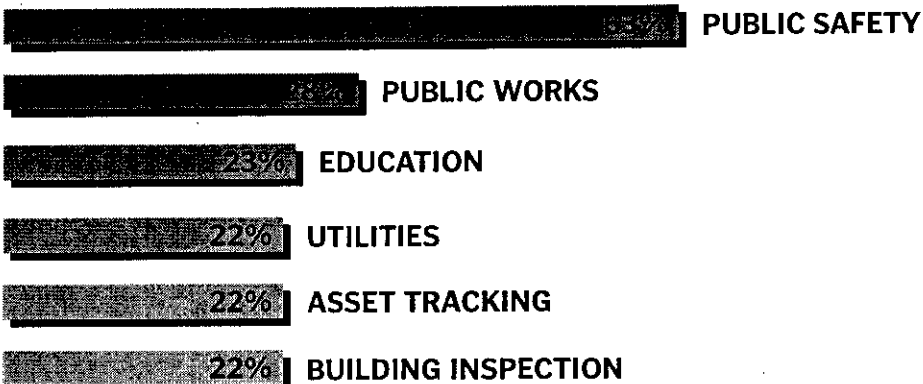
As more municipalities deploy their wireless networks and find demand by local businesses and residential users, the increased network utilization will increase revenues and improve operating efficiency, resulting in improved return on investment and improved political clout for individuals or groups promoting municipal wireless.

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APPLICATIONS

Another factor significantly influencing municipal wireless spending today and in the near term is the type and number of applications being deployed on those networks.

Most initial deployments focused on "first-responder" municipal functions that are heavily communications-dependent, and that are most at risk by physical limitations and security issues of landlines, as well as lack of broadband coverage in many smaller municipalities. Departments such as police, fire and emergency services are natural choices for deployments for municipalities looking to deal with today's heightened security risks and higher telecommunications costs.

MUNICIPAL WIRELESS APPLICATIONS DEPLOYED: 2005

░░░░░░░░	**PUBLIC SAFETY**
░░░░░░	**PUBLIC WORKS**
23%	**EDUCATION**
22%	**UTILITIES**
22%	**ASSET TRACKING**
22%	**BUILDING INSPECTION**

SOURCE: 2005 MUNICIPAL WIRELESS STATE OF THE MARKET REPORT (MUNIWIRELESS.COM)

For that reason, it's understandable that a majority—53 percent—of municipalities with wireless networks today are utilizing them for public-safety applications. But there's another issue to consider when thinking about how deployment of additional and still-evolving new applications will likely drive dramatic growth in municipal wireless expenditures: Relatively few municipalities have deployed more than a handful of applications beyond public safety or even business/residential access. On average, municipalities currently are utilizing an average of about 3 applications on their wireless networks; small cities are utilizing the highest number of applications—about 3.7—on their networks, largely due to the fact that a high percentage of small municipalities are making available their networks for local business and residential broadband access.

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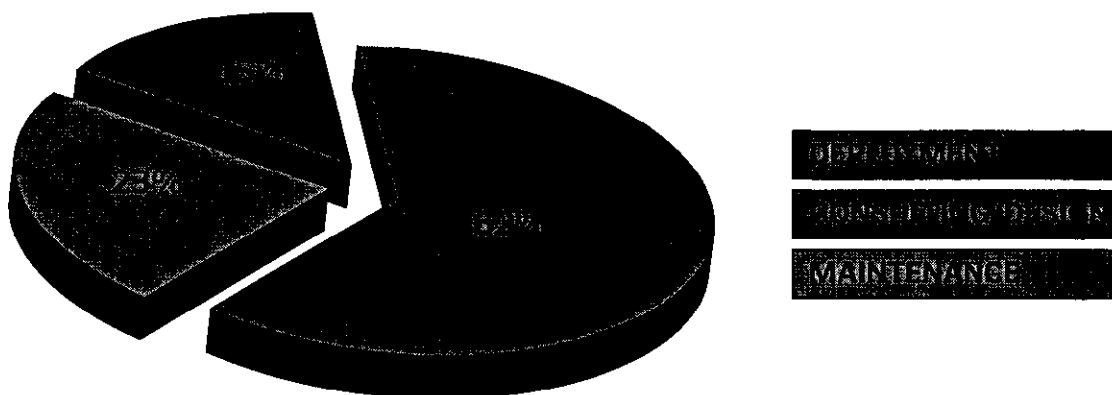**Market Report**
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Our research indicates that no other application yet has achieved more than 28% penetration among municipalities that have deployed their wireless networks to date. Public works, utilities, asset tracking, building inspection and education are all still in their infancy when it comes to municipal utilization; when municipalities become more comfortable with the performance and return on their initial deployments, it's likely they'll begin to turn more aggressively to these new applications. This will result in greater overall expenditures within existing municipalities, but also increased interest and commitment by other municipalities that have not yet taken the plunge.

SPENDING BY DEPLOYMENT STAGE

Understandably, the bulk of municipal wireless spending takes place in the deployment stage, where the lion's share of infrastructure build-out takes place and application provisioning occurs.

Our research indicates that more than 62% of 2005 municipal wireless spending will take place in the deployment stage, although this percentage varies by size of municipality: Large cities devote about 60% of their overall expenditures to the deployment stage, while small cities are allocating about 70% to the deployment stage. That's because larger municipalities are likely to invest more heavily in upfront consulting and system design, either because their networks are more complex or the total project expenditures are both very large and very "conspicuous" for financial and political evaluation.

2005 SPENDING BY PROJECT PHASE

SOURCE: 2005 MUNICIPAL WIRELESS STATE OF THE MARKET REPORT (MUNIWIRELESS.COM)

EXPENDITURE TYPE

One interesting difference in the initial development of the municipal wireless market, compared to other IT-based market segments, is the disproportionately high percentage of initial spending on products and infrastructure, compared to services such as consulting, applications development, training, hosting, systems design, etc.

Throughout most of the IT industry—particularly in deployments of enterprise-class applications such as Customer Relationship Management (CRM), Enterprise Resource Management (ERP) or even compliance mandates—about 60 to 70 percent of total project expenditures are devoted to services, with the minority of spending devoted to products and infrastructure.

That's understandable, considering that those enterprise applications usually have an existing infrastructure base upon which these applications can be deployed. While additional computing, storage and network resources often are required to deploy those solutions, the base technology platform usually is in place.

WIRELESS INFRASTRUCTURE BUILDOUT

Municipal wireless, of course, is different. Wireless infrastructure, until recently, has rarely existed in most municipalities, and must be built from the ground up. That means heavy investment in technology initially; even with the requisite commitment to upfront and back-end services, it means that for the next few years, municipal wireless spending will be dominated by product expenditures.

Now and for the next two years or so, we expect about two-thirds of all municipal wireless expenditures to go to product purchases, either through systems integrators/local VARs or directly to product manufacturers with their own outbound sales forces. Smaller municipalities will almost always deal with a local integrator or VAR, either because the product volumes are too small to warrant a direct interface with the manufacturer or because the municipality lacks enough internal IT expertise to go it alone. Larger municipalities with larger budgets and IT staffs could warrant a direct relationship with strategic product vendors, although it's likely they, too, will probably use integrators, VARs and IT consultants more often than not.

As municipalities build out their infrastructure and launch their initial deployments, their spending patterns are likely to change in subsequent

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years, with more focus on services such as applications development, systems integration and hosting to support the expansion of their applications suites and their geographic coverage areas.

But even as existing municipal networks' spending shifts more toward services, this will be offset (in terms of overall market spending) by the rollout of new wireless networks by municipalities adopting the technology for the first time and thus spending more of their initial budget on infrastructure build-out.

2005 SPENDING BY EXPENDITURE TYPE
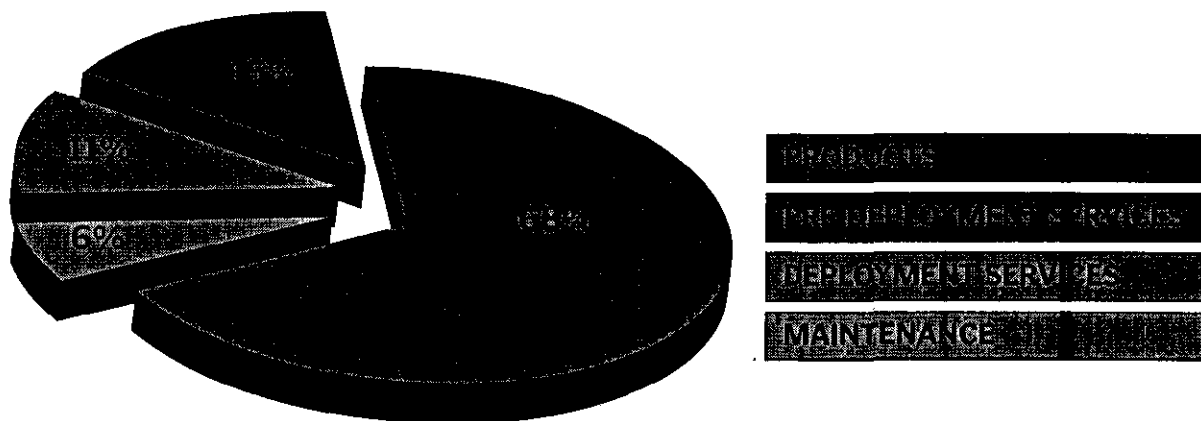
SOURCE: 2005 MUNICIPAL WIRELESS STATE OF THE MARKET REPORT (MUNIWIRELESS.COM)

MARKET DEVELOPMENT OPPORTUNITIES AND CHALLENGES: FACTORS THAT COULD ACCELERATE OR INHIBIT THE MARKET'S GROWTH

Although our estimates for market size and growth rates for municipal wireless solutions are based on what we believe to be the most likely scenarios, there are any number of factors that could affect how large the market becomes and how fast it grows.

GROWTH FACTORS

Factors that could accelerate the development of the market include:
• The success of new business models that allow the cost of the network to be paid for by someone other than the end user—for example, advertising or cost savings on municipal operations

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- Applications that make full use of always-on, ubiquitous connections, such as mobile Voice over IP (VoIP) that is either free or cheap ("Skype on Wheels")
- The availability of Wi-Fi on mobile phones
- Increased competition among equipment providers leading to price reductions, thereby making the networks cheaper to deploy
- Standardization of mesh networks (802.11s) and "mobile WiMax" (802.16e)
- Entry of large systems integrators like IBM Global Services, HP, Northrop Grumman and national ISPs such as Verizon
- A few big-name successes (for example, if large cities currently beginning deployment, such as Philadelphia and Portland, meet most of their objectives)
- Increasing use of Wi-Fi as a city amenity

POTENTIAL STUMBLING BLOCKS

Factors that could inhibit the market's development include:
- Legislation at the federal and state levels that prohibit or restrict municipal broadband (wired and wireless) deployments
- Delay in standardizing mesh and WiMax
- Large-scale failures (if Philadelphia or Portland fail to deliver anticipated benefits)
- Delay in availability of Wi-Fi-enabled mobile phones ("crippling" of mobile phones by carriers)

PLAYING IT ALL OUT: THREE POTENTIAL SCENARIOS FOR THE MARKET'S DEVELOPMENT

Considering today's market realities and potential future developments in such areas as technology, regulation, success stories and ROI tools, we envision three possible scenarios—conservative, likely, optimistic—for the market's development.

CONSERVATIVE SCENARIO

The market will grow at a lower rate if legislation is enacted at the state and federal level that restricts, but typically does not outright prohibit, the deployment of citywide networks by municipalities. In this scenario, cities will deploy networks but only for municipal uses (public safety, public works, etc). Therefore, the amount of equipment, software and services they need will be limited.

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Additionally, if Philadelphia's network is considered to be a massive and expensive failure, some larger cities will shy away from large scale deployments.

Impact on market's development: Market growth would be reduced by 10-25% in 2006 and 2007.

LIKELY SCENARIO

In most probability, the number of states with anti-municipal broadband laws will remain the same, with no new laws enacted to restrict municipal deployments. Assuming the WiMax standard is adopted at the end of this year, as we expect, new-product rollouts will take place in 2006 and deployments in 2007.

We also believe Philadelphia's network deployment will be reasonably successful, meeting at least 70 percent of its goals. Based on preliminary feedback from smaller cities and some counties, we expect they will begin to see returns on investment similar to their initial calculations, particularly as new applications are deployed that require more municipal employees to use the network, thus improving efficiency and lowering operating costs. The networks will continue to allow cities to decrease telecommunications costs as well, creating even further demand for VoIP services. Incumbent telcos and cable companies will continue to view municipal broadband with suspicion, but in some instances, they will work with cities to deploy the service at reasonable rates.

It's also likely that the Federal Communications Commission (FCC) will make available more spectrum for unlicensed use but in the higher frequency ranges. Developers will come out with new applications that take full advantage of always-on, ubiquitous connections. We anticipate that the price of wireless broadband service will continue to drop to under $10 per month and in some cities, service will be free to the end user. Wi-Fi-enabled mobile phones will come on the market, but will be expensive.

OPTIMISTIC SCENARIO

One of the most important developments that could spur further municipal adoption of citywide wireless networks would be Congress passing legislation that actually encourages municipal broadband, wired and wireless deployments, and provides grants to rural communities to roll out these networks.

From a technology standpoint, the market would benefit if standards for

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mesh networks and mobile WiMax are adopted and broadly supported by the vendor community by the end of next year. Open competition among the incumbent operators on projects—dropping their opposition to municipal wireless broadband—is another key factor that could lead to greater market growth. Other potential positive developments could include the FCC opening up more spectrum for unlicensed use at lower frequencies (sub-800-MHz); the availability of inexpensive Wi-Fi-enabled mobile phones, and free access to municipal networks to the end user, supported by alternate business models such as advertising or municipal cost savings passed along to consumers.

Impact on market's development: Market growth in 2006 could accelerate by an incremental 10-15%, and perhaps as much as 30-40% in 2007.

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THE MUNIWIRELESS SUPPLIER ECOSYSTEM

Because most municipalities deploying networks until now have been small cities and towns, the type of equipment, software and services sold in this market have been those that are adequate for small city networks. As such, much of the equipment and software on the market today has not been widely tested in dense urban environments for the simple reason that there are no metropolitan areas that have a citywide Wi-Fi network up and running. In such an environment, hundreds of users would be trying to get on the network at the same time, uploading and downloading large files and talking to one another using Voice over IP applications. As more metropolitan areas roll out these networks, we expect existing vendors to enhance their products' performance and functionality to meet the needs of crowded city environments.

EQUIPMENT

Most municipal Wi-Fi networks use mesh networking technology primarily because it is relatively inexpensive and easy to deploy. The market for mesh equipment is dominated by Tropos Networks, although a few companies such as BelAir Networks, Motorola (which recently acquired MeshNetworks), Strix Systems, Nortel Networks and Firetide have sold equipment to municipalities and wireless ISPs. Tropos initially focused on the public safety market but has since been winning deals in cities that want to provide public access as well. Motorola is considered to be a strong contender in the public safety market. Indeed, Motorola is expected to come up with a solution that combines their mesh networking solution with its Canopy product line.

Mesh solutions sold today are proprietary (the IEEE is still working on a standard for mesh networks—802.11s) and in the range of $2,000 to $6,000 per node. We often hear about startups that have plans to offer nodes as cheaply as $300 per unit, but it's unclear whether they will succeed in this market (except the market for very small communities of under 5,000 people). Although municipalities are price-sensitive, they are also risk-averse and tend to go with vendors that already have proven their ability to deliver in other cities. To succeed, a startup offering a $300 node will have to convince an integrator or ISP to use its equipment in a project. Even then, it will run up against competitors such as Tropos, which already has built relationships with resellers and integrators.

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Although mesh is the most commonly used architecture in citywide networks, a number of municipalities and regions use Vivato's phased array antennas, as well as Alvarion and Motorola Canopy (each primarily for backhaul).

What's surprising is that Cisco, a company that everyone expects to play in this field, has been relatively silent. We expect Cisco to enter the market soon, perhaps by acquiring one or more of the existing vendors.

Even venture capital firms have been showing more interest in wireless broadband mesh networking companies. Siemens Venture Capital announced on September 20 that it is making a strategic investment in Tropos Networks. This came only a month after Siemens led a round of funding for Kiyon, an indoor wireless mesh networking company that focuses on the digital home and RFID markets. In that Series B round for Kiyon, Siemens said it raised $10 million.

SYSTEMS INTEGRATION AND CONSULTING SERVICES

Because many of the early municipalities that have been deploying wireless wide-area networks have been small towns and cities, the market for systems integration (SI) and consulting services has been a regional market. Most of the towns that have deployed networks rely upon value-added resellers (VARs) and IT consulting firms in the same region, usually very small organizations with 20 or fewer employees.

Given that larger cities are beginning to build out networks, global IT firms such as HP and Northrop Grumman are actively participating in bids and winning them. This comes as no surprise since large city networks are more complex and require more personnel and resources for deployment, maintenance and upgrades. Corpus Christi is a good example of a city using the resources of large, publicly traded companies such as Northrop Grumman (automated meter reading), Dell (mobile application for Construction and Permits Department), IBM (police streaming video application) and SAP (vehicle tracking application).

HP has already deployed a network in St. Cloud, Florida and is one of the two finalists in the bid to unwire the city of Philadelphia (the other is Earthlink).

We expect to see companies such as Northrop Grumman that have a lot of experience in government contract work to participate in bids for building large city and regional networks.

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OSS SOLUTIONS

City- and countywide wireless broadband networks need operations support systems (OSS) that can handle authentication of users, access control, security, billing and roaming settlements. Pronto Networks and Airpath are among the better-known providers of OSS solutions. Airpath, a hosted solutions provider, does not sell hardware gateways but has been successful in landing deals with wireless ISPs; its "pay as you grow" business model is attractive to small service providers and city networks that do not want to make a large upfront investment. Pronto Networks, on the other hand, remains popular among larger service providers because it has, as one provider put it, "everything but the kitchen sink." Aptilo, a Swedish company that is better known in Europe and Asia than in the US, is trying to gain a larger share of the US municipal wireless market. Indeed, they are HP's partner in its Philadelphia bid.

As metropolitan areas and counties build out wireless broadband networks, and more municipalities use these networks for their internal operations, we expect to see the larger systems integrators such as IBM and HP put together OSS dedicated to specific segments of the market (public safety, public works, health and human services, etc.).

ISPS

The ISPs that have been building out networks for municipalities have been local or regional players such as Azulstar, NeoReach, Verge Wireless. As the number of deployments has grown, we're seeing these very small local and regional players merge. Recently, MobilePro (which built Tempe's network and is the winning bidder in Sacramento) acquired the WAZ Alliance; US Wireless Online acquired Verge Wireless. What has been most surprising is the entrance of national ISPs such as AOL and Earthlink into this market. Earthlink is a finalist in the Philadelphia bid; AOL was chosen as the winner, but withdrew, from the Madison, Wisconsin project.

Wireless ISPs could also benefit from cities and counties that prefer to have a private entity deploy and run their networks. The controversy surrounding anti-municipal broadband bills proposed in various state legislatures in the past year has convinced many municipalities to use the private-public partnership model to avoid being accused of "unfair competition with private enterprise. (Note: As we also have seen, the incumbent telecoms and cable

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companies are largely behind these anti-municipal broadband initiatives.)

Unfortunately, the same cities and counties that are keen to unwire do not want to spend tax money. They prefer to rely on the ISP to incur the initial investment for building the network and getting customers. While this may be a perfect opportunity to enter a growing market, many wireless ISPs are strapped for cash and unable to make the necessary investment. Moreover, the return on investment is often uncertain. In urban areas, residents have gotten used to free Wi-Fi in cafes and expect it to be free or at least very cheap. When will the ISP recoup its investment? Unless an ISP can get anchor tenants such as the municipality, public schools and transit authority (as provided in Portland's RFP) and turn that into a sustainable business, the municipal wireless market may not be the savior for the wireless ISP community.

Despite the risks, every municipality and county that has put out a bid in the past year has received an overwhelming response from the service provider community. In larger cities, where deployments are complex and expensive, ISPs such as AOL and Earthlink—which have deeper pockets than local providers—are the more logical partners.

THE WILD CARDS
(A) OPEN SOURCE SOFTWARE
Given that the IEEE has not yet agreed upon a standard for mesh networks (802.11s), today's mesh solutions typically are proprietary. What happens if a vendor goes out of business? What can be done to make it even cheaper for communities to afford wireless broadband?

Advocates of open source mesh solutions are pressing cities to look at open source alternatives. The most well-known of these is the Champaign-Urbana Community Wireless Network (CUWIN). CUWIN (www.cuwireless.net) received a grant to pay for the development of the software and the construction and installation of nodes in a pilot project in Urbana, Illinois. The nodes are built using off-the-shelf parts: Soekris single-board computers with 802.11b radios, outdoor enclosures, 64-Mbyte CompactFlash and 8dBi antennas. The purpose is to make wireless broadband even more affordable for communities and allow other people to build upon the software so that the community is not hostage to one provider.

It is too early to tell whether open source mesh networking solutions such as

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CUWIN's will be implemented in a large number of cities and regions. CUWIN needs to test its software in more locations and under more conditions (dense urban environments) in order to improve it. For this, it will need partners to help cover the cost of the hardware and install it in a variety of locations.

However, the cost advantage of open source/open architecture solutions is too significant to ignore, and many entrepreneurs—not just those in the open source community—are busy developing cheaper equipment and software for wide-area networks.

(B) MICROSOFT, GOOGLE AND INTEL

Although Microsoft has not yet played any role in city- and countywide deployments, Microsoft Research has a website devoted to mesh technology (http://research.microsoft.com/mesh). They provide a Mesh Networking Academic Resource Toolkit 2005, and they allow ad-hoc routing and link quality measurement in a module called the Mesh Connectivity Layer (MCL), a loadable Microsoft Windows driver. To figure out what Microsoft might be up to, one should perhaps look at Google's moves in the citywide Wi-Fi space.

Google is said to have just put out an RFP for an optical network to carry voice, data and video traffic. Of course, having a fiber optic network still requires a last-mile component to provide all that capacity to the end user. Recently, however, Google sponsored a Wi-Fi hotzone in Union Square (down-town San Francisco) together with a start-up called Feeva. Feeva's proprietary technology allows one to determine the location of a user; this in turn would allow Google to target advertising using Google Maps and demographic data. Real-time, targeted advertising is one of the most challenging but also lucrative areas of the online ad market. Within a few days of the Union Square announce-ment, speculation about Google's plans to provide free citywide Wi-Fi began to spread. The company has made no announcement concerning its plans in this area but the idea is intriguing because the more city- and countywide networks that exist, the greater the number of "search moments."

The idea that a city might be able to recoup the cost of its investment in wireless infrastructure (and offer free citywide Wi-Fi) through advertising has not yet been tested. So far, the only city that has announced plans to offer free citywide Wi-Fi is St. Cloud, Florida. It will cover the costs of deployment and maintenance through savings achieved by having its police department,

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building inspection and other departments use the network for their operations. However, more and more communities are exploring ways to bring free or cheap wireless broadband to their residents. San Francisco recently issued an RFI that required respondents to submit proposals on how they could bring free or cheap Wi-Fi to all San Franciscans.

The question remains: Will ad-supported networks powered by Google or Microsoft provide enough revenue to support a free or cheap citywide network?

One of the most vocal supporters of city- and countywide wireless networking has been Intel. It launched a Digital Communities initiative in August 2005 whose purpose is to encourage cities and regions to deploy Wi-Fi and WiMax networks. It's understandable that Intel is pushing Wi-Fi and WiMax everywhere: where there are networks to be accessed, there are laptops and other devices—mostly bearing Intel chips—to use them. It comes as no surprise that Intel has opposed anti-municipal broadband legislation in the US. While not favoring municipally deployed networks per se, the company opposes restrictions on municipalities' rights to determine the kind of network they see fit to build. Intel's key role in the development of WiMax chips and the promotion of WiMax means we will see a more aggressive push for WiMax networks. (Note: the few existing "WiMax-based" networks today are proprietary, although the equipment vendors claim they will provide upgrades to the service providers once the WiMax standard is finalized.)

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VENDOR DIRECTORY:
MUNICIPAL WIRELESS PRODUCTS AND SERVICES

WIRELESS MESH EQUIPMENT

Tropos Networks: www.tropos.com

BelAir Networks: www.belairnetworks.com

Motorola (MotoMesh): www.motorola.com

Nortel Networks: www.nortelnetworks.com

Cisco: www.cisco.com

Firetide: www.firetide.com

Strix Systems: www.strixsystems.com

PacketHop: www.packethop.com

Skypilot: www.skypilot.com

Sensoria: www.sensoria.com

RoamAD: www.roamad.com

MeshDynamics: www.meshdynamics.com

Locustworld: www.locustworld.com

POINT-TO-MULTIPOINT ANTENNAS AND BASE STATIONS

Alvarion: www.alvarion.com

Vivato: www.vivato.com

Redline Communications: www.redlinecommunications.com

Aperto Networks: www.apertonet.com

Motorola (Canopy): www.motorola.com

Terabeam: www.terabeam.com

Orthogon Systems: www.orthogonsystems.com

OSS, BILLING AND ROAMING SOLUTIONS

Pronto Networks: www.prontonetworks.com

Airpath Wireless: www.airpath.com

Aptilo Networks: www.aptilo.com

NetNearU: www.netnearu.com

Logisense: www.logisense.com

GoRemote: www.goremote.com

iPass: www.ipass.com

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PUBLIC ACCESS AND ROAMING GATEWAYS

Nomadix: www.nomadix.com

Colubris: www.colubris.com

Bluesocket: www.bluesocket.com

IP3Networks: www.ip3networks.com

NetGear: www.netgear.com

Feeva: www.feeva.com

SYSTEMS INTEGRATORS, CONSULTING FIRMS AND WIRELESS ISPS

IBM: www.ibm.com

Northrop Grumman: www.ngc.com

Hewlett Packard: www.hp.com

Lucent: www.lucent.com

Business Information Group: www.4service.net

PCC Network Solutions: www.pccinc.com

Scientel America: www.scientelamerica.com

Burns & McDonnell Engineering: www.burnsmcd.com

Racom: www.racom.com

Civitium: www.civitium.com

Earthlink: www.earthlink.com

US Wireless Online: www.uswirelessonline.com

ICOA: www.icoacorp.com

MetroFi: www.metrofi.com

Azulstar: www.azulstar.com

MobilePro: www.mobilepro.com

NAS Wireless: www.naswireless.com

Viasys: www.viasyscorp.com

WFI: www.wfinet.com

ONUG Communications: www.onugsolutions.com

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CLOSING PREDICTIONS

A market this new and dynamic obviously will go through many unforeseen growing pains and bends in the road in the next 12 months. So, let's set out a few bold predictions—and we'll bravely revisit these predictions a year from now.

Prediction 1: Dramatic increase in interest from large cities will be the market's top growth engine in the coming year.

Large cities are looking to citywide Wi-Fi to make municipal employees more productive and efficient, and to save on the costs of running a municipal government. Public safety will continue to be the most sought-after application, followed by public works. The second-most-desired use for the network among large cities will be for bringing cheap or free Internet access to low-income neighborhoods and schools.

Prediction 2: Smaller and midsized communities with fast-growing populations will be under increasing pressure to unwire — and they will respond to the challenge.

Take northern California: Many smaller and midsized cities are clustered around the Sacramento area, where people who can no longer afford living in San Francisco and Silicon Valley are moving. Because of budget restrictions, these cities cannot simply add large numbers of employees to deliver the kind of services expected by new and existing residents. Therefore they have to work more efficiently, and having an always-on, ubiquitous broadband network is certainly one major step towards accomplishing that goal.

Prediction 3: Despite often-tiny budgets, very small municipalities in rural areas will be among the most aggressive in moving to wireless broadband.

Many of these communities—under-served by major carriers—still are struggling with dial-up connections and will turn to wireless broadband as a cheap way for bringing faster Internet access to their residents. Dropping equipment prices and standardization will make it much easier for these communities to roll out their own networks.

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Prediction 4: The application software market will be the hottest product segment within municipal wireless.

The deployment of citywide and countywide Wi-Fi on such a large scale will encourage applications developers to create new ways for people to use these networks—from social networking to traffic management. It will also allow people to save money on communications services which today are dominated by a few carriers charging premium prices for connectivity, whether it is broadband or cellular. The creation of these alternative networks, which go around the incumbents, allows many more independent service providers and applications developers to offer their products to the public. We expect to see a boom in the applications market.

Prediction 5: There will be furious legislative battles, which in some areas will impact the market's development.

Because municipal wireless networks get around the incumbent telecom companies and cable operators, these companies will fight to maintain their dominance through legislation. The draft broadband legislation released by the House of Representatives Energy and Commerce Committee is just a starting point. Although it purports to guarantee network neutrality, some provisions—notably the one which requires ISPs to get FCC approval and allows the FCC to deny their application—are worrisome. The "command and control" regime that future broadband legislation may create threatens to stifle the spread of wireless broadband. Passage of anti-municipal broadband bills at the state level—at the instigation of the dominant telco and cable companies—also will hamper the deployment of these networks.

Prediction 6: Debate over spectrum will intensify.

Finally, the issue of spectrum will become more important as more communities roll out these networks. There will be a battle over how much spectrum should be allocated for unlicensed use (favored by people who want to build alternative networks) and those who want spectrum to be auctioned off to the highest bidder (incumbent telecoms providers who want to control networks and keep prices high). It is too early to tell whether the availability of more spectrum (or indeed the failure of the FCC to open up more frequencies for unlicensed use) will have any impact on city- and countywide wireless deployments.

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Municipally Owned Broadband Networks:
A Critical Evaluation
(Revised Edition)

This analysis, revised and updated to reflect national and local changes
during the past two years, finds the case for municipal ownership of
broadband networks is even weaker than it was then. Broadband services
that were scarce two years ago are now plentiful and reasonably priced.
New data from communities that attempted to build and operate municipal
broadband systems suggest taxpayers would be very much at risk, even
under financing schemes involving certificates of participation. A
broadband initiative in Illinois' Tri-Cities area (Batavia, St. Charles,
Geneva) continues to be a useful case study and precautionary lesson for
other communities with similar plans.

1. Advocates of municipally owned broadband networks claim they would produce a long list of benefits.

Critics say telephone and cable companies are moving too slowly to offer affordable high-speed broadband services to many parts of the country, particularly rural areas and small towns. Public construction and operation of broadband systems, they say, can fill the gap. Among the alleged benefits of municipally owned broadband networks are ubiquitous service, greater efficiency, a boost to economic development efforts, lower prices, and access to enhanced broadband services.

2. Broadband services are already available to virtually everyone who wants them.

Unlike two years ago, today virtually everyone who wants broadband services can get Digital Subscriber Line (DSL) service from their telephone company or cable modem service from their cable company. Cable, telephone, and wireless broadband providers have spent billions of dollars rolling out service in areas that were previously underserved. T-1 service is available to businesses over existing telephone lines and Direct Broadcast Satellite (DBS) service is available from DirecTV and EchoStar. MDS (multipoint distribution service), or wireless cable, is widely deployed in smaller towns, and starting next year, WiMax will be deployed in communities across the country.

3. The speed of broadband services is rising and the price is falling.

Critics say platforms other than fiber-to-the-home (FTTH) fail to provide an acceptable level of speed and quality, but this too has changed with time. Most broadband platforms operate at speeds dramatically faster than two years ago. DSL now can reach 3 to 6 Mbps (largely in support of video applications), and an enhancement to the standard that can accommodate up to 15 Mbps will begin deployment in 2005. Cable modems provide high-speed data distribution between 500 Kbps and 4 Mbps, and commercial cable modem services can go even higher. Wireless broadband can reach 54 Mbps, depending on several factors. WiMax will offer speeds of between 17 Mbps and 75 Mbps, depending on distance from the tower and other factors.

> Most broadband platforms operate at speeds dramatically faster than two years ago.

While speeds have increased, prices have fallen. SBC offers DSL "Express" service for $26.95/month and "Pro" service for $36.99/month, and T-1 service for around $250.00 per month. Comcast offers free cable modems and Internet access for $42.95/ month. DirecTV offers satellite broadband service for between $99/month and $129/month; after 15 months you own the equipment and the price falls to between $59/month and $89/month. When WiMax arrives, it is likely to cost $25 a month for broadband and $40 to $50 for a package that includes unlimited telephone service.

4. Municipal broadband is not a boon to economic development efforts.

Consultants often try to sell municipalities on the idea of building broadband networks by claiming they are essential to economic development efforts, but their reports invariably present no evidence of a link between broadband and economic growth. In fact, econometric research consistently finds subsidies to corporations—whether in the form of cheap access to land, sewers, or broadband—are an unreliable and often counterproductive strategy for economic development. Cities and states that make these expenditures do not create jobs or increase personal income at higher rates than cities and states that don't. The expected private benefits of a few users do not justify the cost of connecting every business and household in the community with expensive fiber-optic lines.

5. It is unlikely a public utility would operate as efficiently as competing private companies offering telecommunications services.

Another claim commonly made by advocates of municipalization is that public utilities operate more efficiently than private companies. However, research on the costs and quality of public services produced via municipal ownership versus private provision is extensive and conclusive. It shows *privatization*, not municipalization, delivers significant cost savings, greater accountability and responsiveness to consumers or elected officials, and a level of quality equivalent or superior to public-sector delivery. The claim that municipalization is more efficient than relying on private companies fails on empirical grounds.

6. Cities that have attempted to build and operate broadband networks often report large losses borne by taxpayers or ratepayers.

Of some 55,000 towns and municipalities in the U.S., only about 200, or 0.5 percent, operate municipal broadband networks. Many communities that have taken the plunge have experienced large losses that must be paid for by taxpayers or ratepayers. For example, *Iowa Communications Network* "consistently requires large subsidies to continue in business"; *California's CALNET system* was some $20 million in debt when it was privatized in 1998; *Lebanon, Ohio* originally projected the cost of building its FTTH network at $5 million and ended up spending $9 million and later had to

> "That's why we should not be in this business—you have to keep reinvesting. It's negative cash flow once you consider reinvestment of capital."
>
> — Bill Dunaway, Mayor
> Marietta, Georgia

authorize $14.8 million in mortgage revenue bonds to cover operating losses; and *Marietta, Georgia* lost more than $35 million operating its municipal broadband network before it was sold (at a loss) to American Fiber Systems in September 2004.

7. Municipal broadband networks are very risky ventures.

Municipal broadband utilities most commonly fail or run deficits because the *cost of construction* exceeds initial projections and burdens the utility with high debt retirement costs; *legal restrictions* prevent cities from subsidizing their municipal broadband networks directly with tax dollars or by raising rates for other utilities; *optimistic projections of the number of customers* delivered by contract-seeking consultants have misled many city officials; and the *failure to find content consumers will pay for* limits the appeal of municipal networks. Consultants and municipal officials tend to focus exclusive- ly on bandwidth and the technological advantages of fiber-to-the-home instead of understanding broadband is part of the larger and very competitive entertainment and business services industries.

8. Certificates of participation do not offer a promising alternative form of financing for municipal FTTH networks.

Advocates of municipalization have sought ways to reassure voters that their tax dollars would not be at risk in the event the broadband utility begins to lose money or is forced into bankruptcy. One way to do this is to suggest the use of certificates of participation rather than general revenue bonds to finance construction. But it appears no broadband network in the U.S. has ever been financed by certificates of participation, probably because investors view such projects as being too risky. In a market where broadband services are already ubiquitous and inexpensive, they are almost certainly correct.

The use of certificates of participation may offer somewhat more protection to taxpayers than using revenue bonds, but there is a price to pay for that protection. Generally in such cases, ownership of the

asset is held by the lender while the client—in this case the local governments—pays down the loan. This means the network will not be "community owned" but only leased by local governments from investors. Those investors, in turn, are free to sell the network to other investors or, as one consultant told a group of municipalization advocates on July 7, "we will sell it to Comcast if it doesn't work."

Finally, it would be misleading to imply that arranging for private financing of the *construction* of the FTTH network means taxpayers and ratepayers won't later find themselves "on the hook" to pay for operating costs and upgrades to the system. One of the lessons from other cities that have tried to make municipal broadband networks work but failed is that operating costs per customer are often higher than expected, resulting in the need for annual subsidies. Using certificates of participation would not protect taxpayers and ratepayers from having to pay more to keep the utility operating in the years ahead.

9. Generally speaking, municipal ownership of broadband networks is probably not in the best interests of residents and most businesses.

Generally speaking, municipal ownership of broadband networks is probably not in the best interests of residents and most businesses, even in communities not well served today by private providers. Access to broadband services is more plentiful than advocates of municipalization claim or admit, suggesting the real issue is not availability but *price* and who should pay it.

> Access to broadband services is more plentiful than advocates of municipalization claim or admit, suggesting the real issue is not availability but *price* and who should pay it.

It is unlikely that more than a small number of residents would benefit from a municipally owned broadband network, that their benefits would justify the steep cost, or that it is fair to force other residents and businesses to subsidize them. It is fanciful to imagine that municipal broadband is a cost-effective way to promote economic development.

Very few cities attempt to build and own broadband networks because the costs and financial risks are too great. Cities that have taken the leap simply illustrate the riskiness of the venture, costing their taxpayers and ratepayers millions of dollars in subsidies with no end in sight. Threatening to build a municipal broadband network may have been a good strategy two years ago, to prompt incumbent cable and telephone companies to make good on past promises. Following through with municipalization, however, is not a good idea.